 25X1

SECURITY INFORMATION

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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COUNTRY : USSR

DATE DISTR. 17 JUL 52

SUBJECT : Miscellaneous Technical Information, Zavod No 1, Podberesje

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DATE ACQUIRED [redacted]

SUPPLEMENT TO REPORT NO. 25X1

DATE OF [redacted]

THIS IS UNEVALUATED INFORMATION

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[redacted]

THE 346 AIRPLANE

1. The 346 airplane crashed on its second, or third, powered flight. The flight was made from a place called Lukowetz or Lukowitze [redacted] the village of Lukovets [redacted] of Voronezh, might possibly be near where the field was located for the following reasons: 25X1

   [redacted] Lukovets was approximately 200 km from Moscow /although the village [redacted] is considerably more than 200 km from the center of Moscow, it might be considered "approximately" 200 km south of the edge of Moscow7.

   [redacted] names of Gubkino and Nikolskoye used in connection with Lukovets. While there are hundreds of towns named Nikolskoye, Gubkino is not quite so common. 25X1

   [redacted] the Soviets were building a new runway there.

SECRET

SECURITY INFORMATION

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2. With Ziese as test pilot, the airplane was carried by a TU-4 to an altitude of approximately 7000m. At this altitude Ziese fired the explosive fittings supporting the 346, the plane dropped free, and the rocket engine was started without difficulty. When speed and altitude were increased, serious vibration was encountered, forcing the pilot to slow down. According to rumors, Ziese again increased the speed, but such violent vibration was encountered that the tail assembly broke off. Ziese jettisoned the cockpit, dropped to a safe altitude, escaped from the cockpit from the prone position bed, and then came down by parachute. He broke a leg in landing. The airplane was a complete loss. This accident happened after the returnees had been released from work and alerted for return to Germany in September 1951. Strict security surrounded circumstances of the accident, and [redacted] Germans were not allowed to talk to the pilot, Ziese. [redacted] the crash may have had something to do with the delay in shipping the Germans home. About 60 Germans who had been released, including Siebel preliminary design engineer, Siegfried Guenther, were being held there, instead of being allowed to return to Germany. 25X1

3. [redacted] it used the same basic engine (Walther Ofen) as the ME-163, but it differed in that the distance from the pumps to the combustion cans [redacted] there were two combustion cans) was about twice that of the ME-163. The total length of the 346 engine assembly was about 4 meters. 25X1 25X1

THE EF-150 AIRPLANE

Status:

4. Only two EF-150 airplanes were built--one for flight, and one for static tests. The EF-150 was originally intended to be ready for flight some time during the middle of 1951. Although it had top priority in the shop, it was not ready for shakedown tests until the fall of 1951. At this time troubles were encountered with various components in the airplane. [redacted] Concerning the test field for the EF-150, the Germans would like to see Borki used, (which is located near the Volga River between Podberesje /56° 46' N - 37° 10' E/ and Kimry /56° 54' N - 37° 18' E/) because of its convenient location and the ease with which the airplane could be transported down the Volga River. [redacted] the EF-150 might be flown from Lukovets field, where the 346 was tested. If this field were used, it would mean that the airplane would have to be almost completely dismantled for shipment. 25X1 25X1

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[redacted]

5. [redacted] Guenther Schroeter, an EF-140 flight test engineer, had turned down the job of flight testing the EF-150, hoping to get back to Germany sooner. Ironically, he is still in the USSR. Willi Lehmann then offered to do the job and was accepted. Lehmann had been a flight test engineer, first on the EF-126 and then on the experimental EF-150 servo mechanism installed in a JU-388.

6. [redacted] 25X1

7. One series of static tests had been completed. They were all run at Podberesje. Following the tests, analysis of the results disclosed that the test specimens had only been tested to 95% of the load intended. This was considered acceptable by the "State Commission from Moscow", [redacted] the 25X1 performance requirements had been increased, and that new tests would have to be run at higher loads. [redacted] 25X1 this was probably a maneuver on Chief Designer Baade's part to get a new lease on life for the EF-150. The original completion date had not been met, and it would thus be to the designer's advantage to present something new. These new tests had not been started [redacted] in January 1952. Drop tests 25X1 were also planned but had not been started.

8. Low temperature tests on various hydraulic components had been started in October 1951 under the direction of Boris von Schlippe (fire extinguisher designer). How much of this program had been completed is not known, [redacted] assume it was to 25X1 be finished in January 1952. Alfred Bormann, assistant to the laboratory chief, Keller, set up the schedules of these tests. Tests on individual components of the servo mechanism flight system had been run satisfactorily, but mechanical failures were encountered when the entire system was operated on the test stand. [redacted] 25X1 [redacted] Hot air de-icing tests were completed and considered 25X1 satisfactory. /See paragraphs 30, 31 and 32 of this report./ Fuel tank tests were completed and considered satisfactory. /See paragraphs 22-29 of this report./ Landing gear tests had been completed under my direction. The retraction mechanism was satisfactory, but the shock struts leaked excessively due to the cylinders not being honed. Honing had been omitted at Soviet request, since they were always looking for production shortcuts. When it was proven that honing was necessary, it was found that stones and stone-holders were not available. The holders were to be fabricated in the plant, but had not been made as of 1952. [redacted] 25X1

[redacted]

 25X1

[redacted]

[redacted]

Power Plants:

11. [redacted] the EF-150 engines arrived [redacted] in the plant in August 1951. [redacted] the EF-150 engines referred to as "Rolls-Royce Nene". [redacted] the engines bore any resemblance whatsoever to the original Nene. In the first place, [redacted] the thrust of the EF-150

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[redacted]

engine was 4500 kg. [redacted] the 150 engine appeared to be an axial flow type, whereas the Nene was a centrifugal type. [redacted] The combustion chambers were covered by a sheet metal housing, hence their type is not known to me. The EF-150 engine was approximately 1.3 meters in diameter and 2 meters long. [redacted] the tail-pipe diameter was 70 cm [redacted] The length of the pod was about 3 meters [redacted] hot air was supplied by the engine at a pressure of four atmospheres and a temperature between 250-300 degrees centigrade. [redacted] "Lulko" engines were to be used in the EF-150 but [redacted] no other information about these engines.

12. /The EF-140 engines were also discussed in an effort to get a comparison with those for the EF-150./ [redacted] The EF-140 engine was known as the "Mikulin". [redacted] the Mikulin looked something like a Nene and therefore, may also have been a centrifugal turbojet. [redacted] the maximum diameter was about 1.3 m and the length was 1.7 m. [redacted] the exhaust pipe was about 60 mm in diameter. Only Mikulin personnel were allowed to work on these engines. Sheet metal covers were kept on the intake and exhaust except when the engines were to be operated. [redacted] little opportunity to see inside the intake or exhaust, but [redacted] there was an automatically controlled cone in the tail pipe. [redacted] one test flight wherein the automatic control device was deliberately made inoperative. [redacted] the Mikulin for the EF-140 was designed to deliver a thrust of 3500 kg but actually produced 3640 kg. [redacted] the Mikulin engine used the same fuel regulator as the JU-004 [redacted] The Soviets sent the faulty regulator to the plant in Podberesje, requesting that the Germans repair it or supply a new one. [redacted] a compressed air starter was used.

13. [redacted]

Fuel System:

14. The airplane had one integral fuselage tank and an unknown number of bladder-type wing tanks. /See paragraphs 22-29 of this report./

25X1 [redacted]

[redacted]

Hydraulic System:

16. The EF-150 airplane utilized hydraulic components almost exclusively. [redacted] The system operated at 100-110 atmospheres pressure, except for the camera door which was operated at 30 atmospheres. The main pumps, engine driven gear type, were of Soviet design [redacted] They were designed to deliver 80 liters per hour and 100 atmospheres pressure at 4000 RPM. These pumps were of good quality. They were tested by running them for 40 hours on hydraulic oil and four hours on kerosene. (In the event that the hydraulic oil should be lost, it was planned to use fuel, so that an emergency landing could be made.) The pumps passed the tests satisfactorily. After running on kerosene and then switching back to oil, the pump output was less than before, but since kerosene was to be used only in emergencies, this was not cause for rejecting the pumps. An attempt was made to build pumps at Zavod No 1, but this was not satisfactory, since the proper machines and materials were not available. 25X1 25X1

17. An emergency propeller driven oil pump was also provided. In the event that both engines failed, this pump could be extended into the wind and provide enough hydraulic power for an emergency landing. The propeller used was about 45-50 cm in diameter, three-bladed, and constant speed. The method of controlling the propeller speed was known as the "Seppeler" system. [redacted] in this system, propeller control was accomplished by means of springs, but am not sure of the details. A pump unit was sent to TsAGI (Central Aero-Hydrodynamic Institute) for tests in a wind tunnel. During the first test the support arm broke. The arm was cast of a German material known as "Silumin ". The arm was redesigned, cast of the same material, and reinstalled in the test specimen. [redacted] 25X1 25X1

 [redacted]

18. [redacted] the Soviets were considerably behind times where hydraulics were concerned. For example, in 1949 they were just setting up hose and fitting standards based on the Parker system. A man named Bashta (Башта) was supposed to be the top Soviet authority on hydraulics. He published a book in 1948 or 1949 which contained nothing more recent than the German wartime systems. [redacted] Soviet hydraulics personnel [redacted] a Soviet named Kondratev (КОНДРАТЕВ), assistant to DuBois, in the Hydraulics Design Section./ In June-July 1951 a group of students made an inspection trip through the laboratory. They were apparently getting material for a thesis. One of them "borrowed" a rough sketch [redacted] of the EF-150 landing gear strut. In August 1951 several men from TsAGI set up the EF-150 landing gear prior to the tests. These men were mechanics and not engineers, but they were good men and knew what they were doing. [redacted] In October-November 1951 (fnu) Ivanov (Иванов) came from the Bashta Plant in Moscow and took over the hudraulics laboratory at Zavod No 1. /This man is not to be confused with other persons by the same name who have previously been reported as part of the Zavod No 1 organization./ 25X1

19. The following items on the EF-150 were hydraulically actuated:

(1) Landing Gear

The EF-150 had bicycle type landing gear. /The general configuration is shown on Enclosures (A) and (B)./ Sketches [redacted] show the outrigger gear on the wing tips /instead of in the engine nacelles as earlier reports from other sources have indicated. These earlier reports were based on the EF-150 mockup./ The location of the outrigger gear was changed for reasons unknown [redacted] 25X1

(2) Brakes

The brakes were a Soviet copy of an American internal expanding shoe brake. The shoes were hydraulically actuated by means of an expanding hose in each brake. The EF-150 brakes were the same as the latest type used on the EF-140. Earlier EF-140 brakes were from an American B-24.

(3) Flight Controls

All axes were controlled through a hydraulic servo mechanism. There was no mechanical connection between the controls in the cockpit and the control surfaces. The hydraulic "aggregate" was mounted in a frame under the cockpit floor. Motion and force were mechanically transmitted from the hydraulic aggregate to the control surfaces. [redacted] 25X1

(4) Landing Flaps

Split type landing flaps were actuated by hydraulic cylinders, but further details are not known [redacted] 25X1

 [redacted] 25X1

(5) Bomb Bay Doors

[redacted] the doors were in two sections, each side sliding up inside the bomb bay. Both the operating and locking of the doors was accomplished hydraulically, but [redacted] no further details. 25X1 25X1

(6) Gun Turrets

A test was once made on a hydraulic turret drive. In this set-up power from an oil motor went through a worm gear reduction to the turret ring. The performance of this turret drive was unsatisfactory [redacted] 25X1

(7) Tail Gunner's Exit Door

[redacted] believe that the door was opened by a hydraulic cylinder, but am not positive. 25X1

(8) Tail Gunner's Seat Lift

In order to provide for better downward sighting of the guns, the seat could be raised about 70-80 cm. Hydraulic cylinders pushed the seat up and down in tracks. The seat was controlled by a foot pedal.

Pneumatic Systems:

20. [redacted] the tail gunner's escape door may have been so actuated. 25X1

Electrical Systems:

21. The hydraulic system was electrically controlled by solenoid valves. [redacted] assume that they were controlled by a mechanical linkage. [redacted] 25X1 25X1

EF-150 Fuel System:

22. There was one integral fuel tank located in the fuselage over the bomb bay [as shown on Enclosure (D)]. [Details of this tank are shown on Enclosures (E) and (F).] [redacted] this tank [redacted] would hold approximately 8000 liters. The purpose of the tubular compartments inside the tank was to reduce the effect of gunfire. [See the table on Enclosure (D) for sizes and number of the cylinders.] In use, fuel would be taken first from the part of the tank outside of the tubular compartments. If one or more of the cylinders should be damaged by gunfire, check valves under each cylinder [see Enclosure (F)] would prevent fuel from flowing into the damaged compartments. There were also check valves provided [as shown on Enclosure (E)] in case individual lines were damaged. There was a separate line for the fuel outside of the cylinders 25X1 25X1

 25X1

 [redacted]

and another for that taken from inside the cylinders. These lines were approximately 40 mm in diameter.

23. Each cylindrical compartment was made of rolled sheet aluminum with lapped seams sealed with Thiokol. These seams were not riveted or welded. If a cylinder leaked after assembly, it was patched with Bakelite. The cylinder ends were made from stamped sheet metal parts and had the fittings welded on. The cylinders were installed in the valves by means of bayonet fittings and sealed with "O" rings. The "O" rings furnished by the Soviets were too hard, hence they were grooved [as shown on Enclosure (F)] in order to provide sufficient resiliency. The cylinders were also supported at the top and bottom by sheet metal brackets. [redacted] 25X1

24. [redacted] the wartime rubber self-sealing tanks were more effective and less costly. [redacted] do not know who originated the idea for the EF-150 fuel tank. 25X1 It may have been Chief Designer Baade's or Chief Hydraulics Designer DuBois' idea, but it was definitely not Soviet. [redacted] bladder type cells for 25X1 internal wing tanks [redacted] were two different sizes, shaped to the wing contour, [but of the approximate dimensions given on Enclosure (G)]. The cells were made of a rubberized fabric about 3-4 mm thick. [redacted] 25X1 assume that there were two of each size. If so, the wing tanks would hold approximately 5500 liters. There were no external tanks. [redacted] 25X1 The fuselage and wing tanks described above would give a total estimated capacity of 13,500 liters.

25. [redacted] 25X1 There was a fitting in the center of the floor of the fuselage tank, [redacted] 25X1 All fuel could be dumped in an emergency [redacted]

26. The EF-140 fuel system was also discussed, to get some background information. On the EF-140, the single point refueling connection was located in the fuselage in the main gear wheel well. The EF-140 booster pumps were of the wobble plate type and engine driven. They were referred to as "American Booster Pumps". [redacted] 25X1 Air pressure was used in the aft fuselage tank in order to empty it before the forward one.

27. The tank in the static test fuselage of the EF-150 was checked for leakage before and after the static test. In addition, three other special tanks were made up, one for leakage tests and two for gunfire resistance tests. The

 25X1

 [redacted]

specimen for leakage tests did not resemble the actual tank in cross section. It was somewhat triangular in shape and was intended primarily to determine the leakage around the fuselage stringers that ran fore and aft through the tank. In the early tests (1950) excessive leakage was found around these stringers. For these tests, Thiokol was used as a sealing material. Later tests (completed in April 1951) were satisfactory [redacted] 25X1 [redacted] 25X1 No tape or fibrous filler was used at any of the reveted seams. The tanks were tested for leakage by pressurizing them with air and determining how rapidly the pressure dropped. [redacted] 25X1 [redacted] 25X1 the usual Junkers practice was to use 0.2 atmospheres.

28. Gunfire resistance tests, run under the supervision of Alfred Bormann and witnessed by the "State Commission from Moscow", were also completed in April 1951. The Commission said that the tanks were "not bad" even though the rubber valve flapper under one tubular compartment was pushed through the valve seat permitting fuel to leak out. The gunfire test specimens had the same cross section as the airplane tank but were only 1.40 m long. They were filled with fuel but were not pressurized for the gunfire tests. [redacted] 25X1 .22 mm ammunition (Ball, A P, and tracer) was fired into the tank specimens at various angles.

29. No vibration, slosh, or drop tests were conducted on the fuel tanks. It was planned to conduct flow evaluation tests on the completed airplane [redacted] 25X1 Tests were made in the laboratory to determine the ability of rubber materials to withstand swelling when submerged in kerosene. [redacted] 25X1 [redacted] 25X1 the material did swell, but this factor did not cause any trouble. The main problem was that the material was not resilient (which necessitated grooving of the compartment seals as mentioned previously) and was not uniform in dimensions. The lack of uniformity in thickness of rubber sheet stock caused considerable trouble in making flappers for checkvalves.

EF-150 De-Icing System:

30. [redacted] de-icing system [redacted] 25X1 [redacted] used in the EF-150. [redacted] 25X1 it was the same as a wartime German system, wherein ice was allowed to build up on the leading edge of the wing before the heat was turned on. Heating the leading edge broke the adhesion of the ice, and the force of the air stream was utilized to get rid of the ice. The system was not turned on continuously. [redacted] 25X1 supply of hot air [redacted] 250-300 degrees Centigrade for temperature and 4 atmospheres pressure. This hot air went through a pressure reduction valve (spring and diaphram type) where the pressure was reduced to 0.4 atmospheres. [redacted] 25X1 the temperature remained the same except for that lost in expansion. From this reduction valve, the hot air went to a mixing nozzle located in the duct of the leading edge of the wing /as shown in Enclosure (H)/. [redacted] 25X1 the temperature [redacted] was about 85 degrees Centigrade. The mixing nozzle could not be adjusted after the leading edge was installed. The sketch I

 25X1

[redacted]

prepared /Enclosure (H)/, also shows the construction of the leading edge of the wing. Two thicknesses of skin were used, the inner one being corrugated to form ducts for the warm air. After the air passed through the skin corrugations, it flowed aft and escaped out around the flaps and ailerons. Spanwise flow distribution was controlled by decreasing the area of the exits of those individual corrugations where the temperature was found by test to be too high. The test results showed that very little such adjustment was necessary. [redacted] 25X1 There were 25X1 no thermocouples or other temperature pickups located in or on the leading edge of the wing.

31. There was a heat exchanger in the forward part of the engine cowling. [redacted] this was used to cool air used to pressurize the cabin. 25X1 It may have also been used in conjunction with de-icing system. The leading edges of the vertical and horizontal stabilizers were heated in the same manner as the wings. No tests were run on the empennage de-icing. Hot air for the tail section was led through the fuselage by 50 mm diameter ducts of an aluminum known as "ANTs". (AHЦ). There was no specific provision for de-icing the engine air intake, but the heat exchanger mentioned above might possibly heat the cowling. The EF-140 had wire screens in the engine air intake [redacted] 25X1

32. [redacted] de-icing tests [redacted] The test specimen consisted of a wing leading edge borrowed from the airplane. A paper template was made up which had numerous small rectangular holes cut in it. This template was laid over the outside of the test specimen and the entire surface was coated by brushing on hot paraffin. After the paraffin had cooled and hardened, the template was removed leaving small patches of paraffin. These patches were used as indicators to determine the uniformity of heat distribution over the skin surface. The test was started and the condition of the paraffin was observed at regular intervals.

MATERIALS

Aluminum

33. [redacted] there were five kinds of aluminum used in Podberesje. 25X1 One was very soft and appeared to be practically pure aluminum. Two others were similar to the German aluminum, known as "Pantal". One of these was softer than the other [redacted] 25X1 All three of these were weldable. Tubing was generally made of one of the Pantal types. There were two types of alclad duraluminum. One of these appeared to be similar to the German aluminum DU42 (42 KG/MM^2 ultimate tensile strength). The coating appeared to be about .10 mm thick. The second one was known as D16T. It was stronger than the other and had a thicker coating. [redacted] 25X1 the ultimate tensile strength was approximately 45 kg/mm^2, the thickness of the aluminum coating at approximately .5 mm. D16T was difficult to work in a hardened condition but could be annealed and re-hardened after forming. Neither

[redacted]

6 type of dural was weldable. Standard size aluminum sheets were approximately 3 x 1-1/2 meters. These materials were most commonly used for structural parts.

Steel

34. A steel known as "ZOKhGSA" (30ХГСА) was most commonly used for aircraft parts; for example, landing gear on the EF-150. This material appeared to be very tough. [redacted] 25X1
7 ultimate tensile strength figures [redacted] estimate about 100 25X1
kg/mm^2 before heat treat. It could be heat treated to about 120 kg/mm^2. This steel could be either heat treated or case hardened. [redacted] a very soft and ductile steel 25X1
known as S10. The ultimate tensile strength was about 50-60 kg/mm^2. Another steel known as S20 had a tensile strength of approximately 70 kg/mm^2.

Flexible Hydraulic Hose

35. [redacted] four Soviet and one German type hose used at Podberesje. 25X1
The German hose (Argus) was the most flexible at all temperatures, even though five years old when tested. Tests were run on these during the summer of 1949 to determine their ability to withstand pressure. Standards were also
8 set up to convert from the German metric sizes to the Russian inch system, which [redacted] was based on the American Parker 25X1
fittings. /Enclosure (I) shows a sketch of the type of fitting used./ These hoses were used during the winter of 1949-1950 and were entirely satisfactory. In 1950 [redacted] 25X1
following tests on Soviet designed hose:

(1) Tests in which the hoses were subjected to increasing pressure until failure. Pressure was increased in 25 and 50 atmosphere increments and the length and diameter noted at each step. No protective clothing was provided and the test operator frequently got a bath of hydraulic oil.

(2) Flexing tests at 100 atmospheres pressure and room temperature. The section of hose being tested was held rigidly at the ends, and was attached to the rod of a hydraulic cylinder in the middle. When the cylinder rod was at either end of its stroke, it forced the hose to make four right angle bends. Moving the cylinder rod reversed the bends. The bend radii were about four times the diameter of the hose.

(3) Low temperature tests. In those tests only one right angle bend was made in the hose at a 4D radius. Cold tests were run both with and without the specimen being pressurized.

The following types of hoses were tested:

(1) A synthetic rubber hose of Soviet design which had a steel webbing imbedded in the rubber. This specimen failed in test No (3) /above/ at approximately minus 30 degrees Centigrade.

(2) This type had a rubber and cord construction similar to that of an automobile tire. It was an improvement over the first type [redacted] 25X1

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 [redacted]

(3) This was similar in appearance to type 2, but the test results are also unknown to me.

(4) The best Soviet hose tested was manufactured by Moskovsky Kauchuk (МОСКОВСКИЙ Каучук). Its appearance was similar to (2) and (3) /above/. This one was almost as good as the German hose but was slightly less flexible at all temperatures. It could be bent in a 4D radius at temperatures as low as minus 60 degrees Centigrade. [redacted] 25X1 this hose was probably adopted 25X1 for the EF-150. [redacted] the Moskovsky Kauchuk hose carried the name of the manufacturer and the date /as shown on Enclosure (I)/. [redacted] 25X1 another trademark--the letters RWD 25X1 (РВД), but have forgotten whether this was in conjunction with the airplane trademark or not. There was no trademark on the type of hose with the imbedded steel webbing.

Synthetic Rubber Seals

36. Soviet synthetic rubber used in various seals was too hard. For this reason, troubles were encountered with the "O" seals used in the tubular compartments of the fuselage fuel tanks. The seals were modified by cutting a groove around the outside diameter of the ring /as shown on Enclosure (F)/. This modification enabled the seals to be used effectively. [redacted] 25X1 no difficulties were encountered due to excessive swelling. The chevron type rings used in the landing gear shock struts appeared to be of the same material as the "O" rings described above. After 200 cycles of life test on the oleo strut, the strut was disassembled and the seals examined. When first examined, the material appeared to be all right. However, after two days in the open air, blisters began to appear on the surface of the seals. It then looked as though the seals had been made from vulcanized rubber bands instead of being molded in one piece. The vulcanization appeared to have failed, permitting the blisters to form. This was substantiated by the Soviets. The hardness of the seal material also contributed to leakage in the struts. In spite of the hardness, however, the seals had a tendency to extrude between the piston and cylinders of the struts. Backing rings were used to correct the extrusion troubles encountered. /Sketches of the seals will be forthcoming in a later report on landing gear cylinders./

Hydraulic Oil

37. Prior to the winter of 1950, an oil known as MVP-60 (МВП-60) was used. It was received ready-mixed; hence, [redacted] 25X1 25X1 the oil did not contain any glycerine. [redacted] the specific gravity was .8 [redacted] 25X1 Its color was difficult to describe but was "bluish" 25X1 when poured from the can. When it had absorbed air in use, it became a sort of gray-green color. This oil was used at Borki in the EF-140 during the winter of 1949-1950, but it became so thick at -40 degrees Centigrade that the hydraulic system would not function. For example, a solenoid valve normally requiring .10 second to operate at room temperature required 20 seconds at -40 degrees Centigrade when this oil was used. When making viscosity checks at -40 degrees Centigrade using a steel ball in an oil-filled glass tube, the

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[redacted]

steel ball would remain at the top of the tube when it was inverted. Following these experiences with the MVP oil, a new oil came into use. This oil was red in color and known as "Ziatin". /This is a German phonetic spelling as the oil was a closely guarded secret [redacted] 25X1 [redacted] this oil was satisfactory at -40 degrees 25X1 Centigrade and believe that it was still fluid at -60 degrees Centigrade. This oil was also received in five-liter unmarked cans, ready-mixed. [redacted] the markings were removed 25X1 from the cans by Soviets who worked in the storage dump.) At first there was not a sufficient supply of Ziatin to permit its use exclusively. Consequently, it was mixed with the MVP oil in order to make the limited supply go further. By the fall of 1950 Ziatin was received in sufficient supply to use it alone.

Fuel

38. The fuel used was known as kerosene. [redacted] 25X1

- end -

ENCLOSURE: (A) Side View of EF-150

ENCLOSURE: (B) Front View of EF-150

ENCLOSURE: (C) Top View of EF-150

ENCLOSURE: (D) Fuselage Tank Location

ENCLOSURE: (E) Details of Fuselage Tank

ENCLOSURE: (F) Details of Tank Compartment

ENCLOSURE: (G) Wing Tank Cell

ENCLOSURE: (H) Details of De-Icing System

ENCLOSURE: (I) Details of Hydraulic Hose

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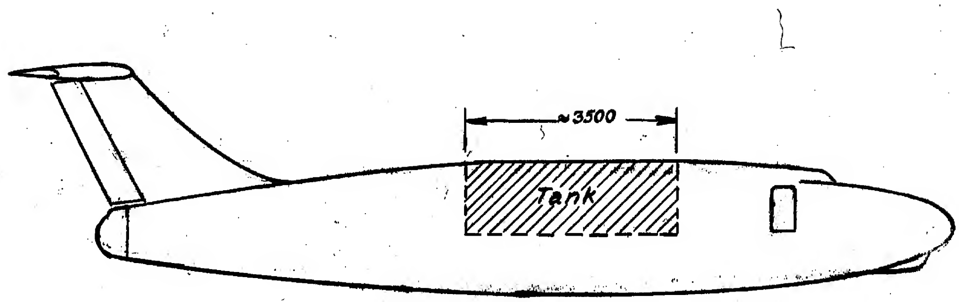

Total length of tank ≈ 3500 mm
Total capacity of tank ≈ 8000 l.

Pipe №	Pipe length ≈ mm	Number in tank ≈
1	440	22
2	650	18
3	820	22
4	950	18
5	1060	22
6	1120	18
7	1150	22
8	1175	18
9	1200	31

191 pipes total

FUEL TANK PLAN - AIRPLANE MODEL EF 150

ENCLOSURE (D)

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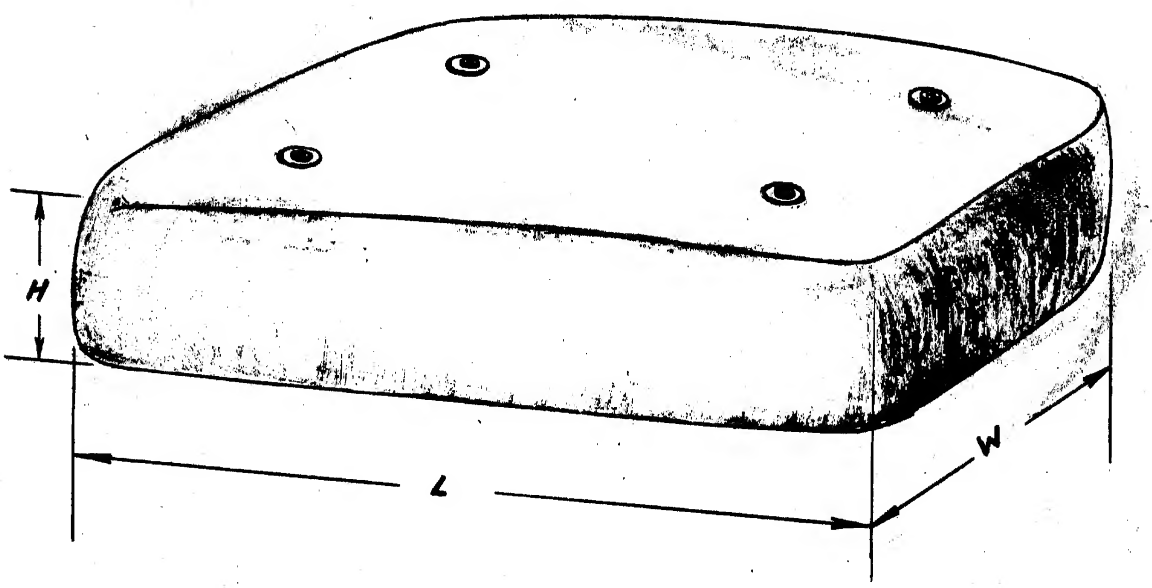
Estimated Dimensions of Wing - Tanks in cm		
L	W	H
180	130	40÷50
250	150	40÷50



WING FUEL TANKS - AIRPLANE MODEL EF 150

ENCLOSURE (G)

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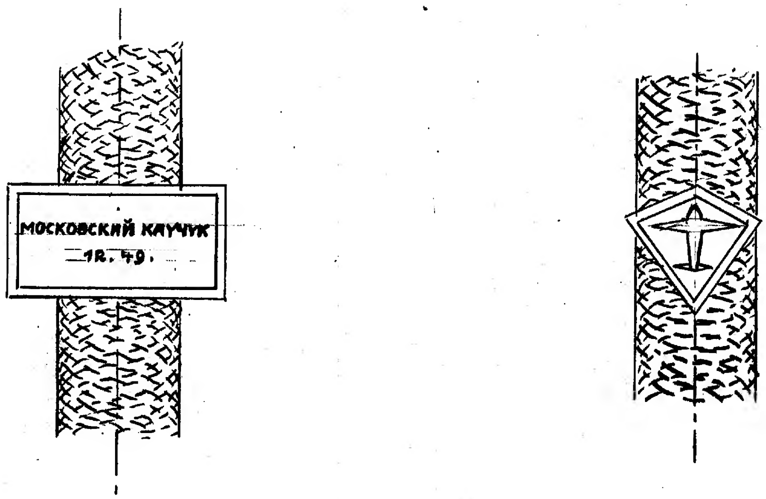
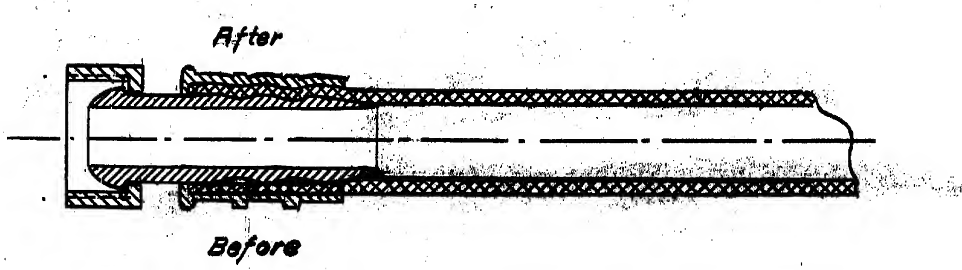


HYDRAULIC HOSES



HYDRAULIC HOSE FITTING

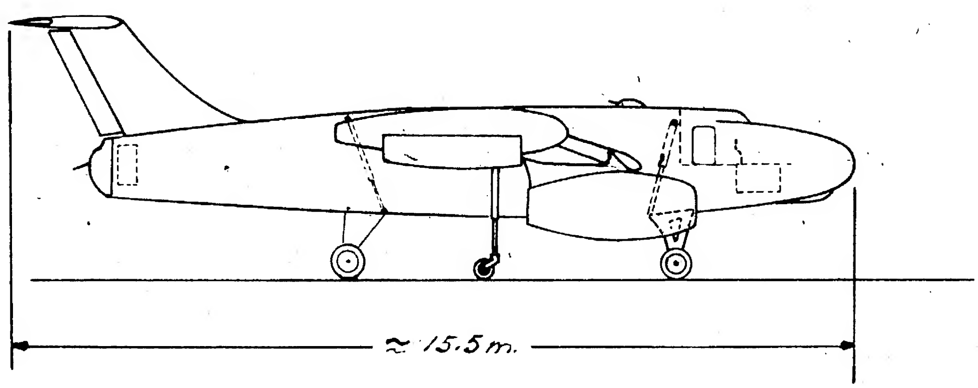
AIRPLANE MODEL EF150

ENCLOSURE (I)

SECRET

25X1

SECRET
SECURITY INFORMATION



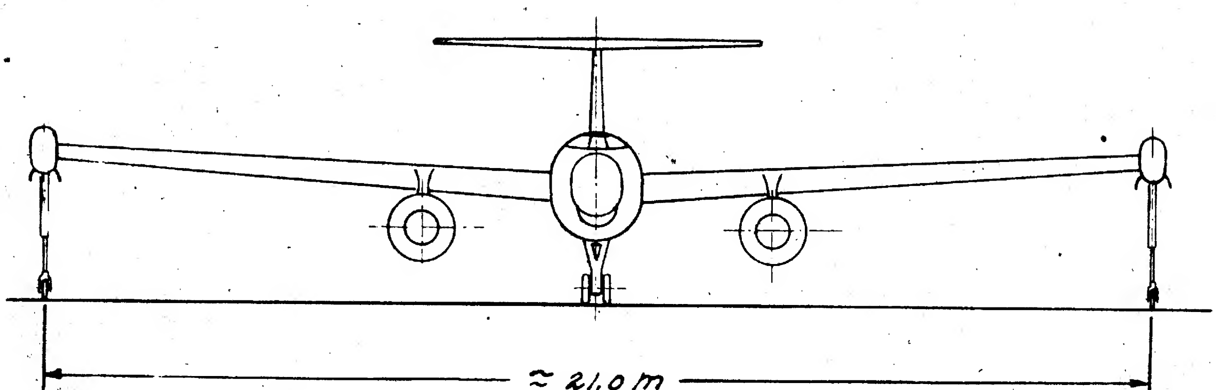
ENCLOSURE (A) SIDE VIEW OF THE EF-150 AIRPLANE.

SCALE 1:100

SECRET
SECURITY INFORMATION

SECRET
SECURITY INFORMATION

25X1



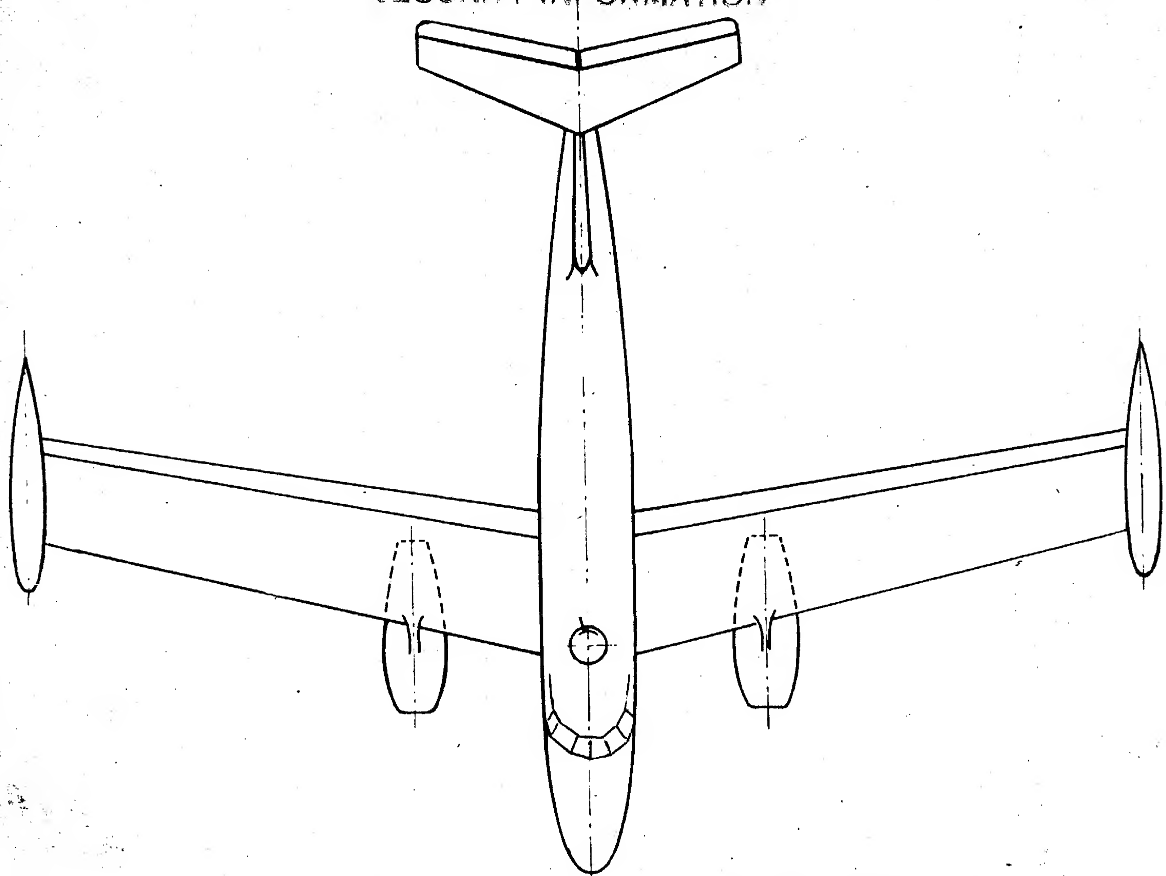
ENCLOSURE (B) - FRONT VIEW OF THE EF-150 AIRPLANE

SCALE 1:100

SECRET

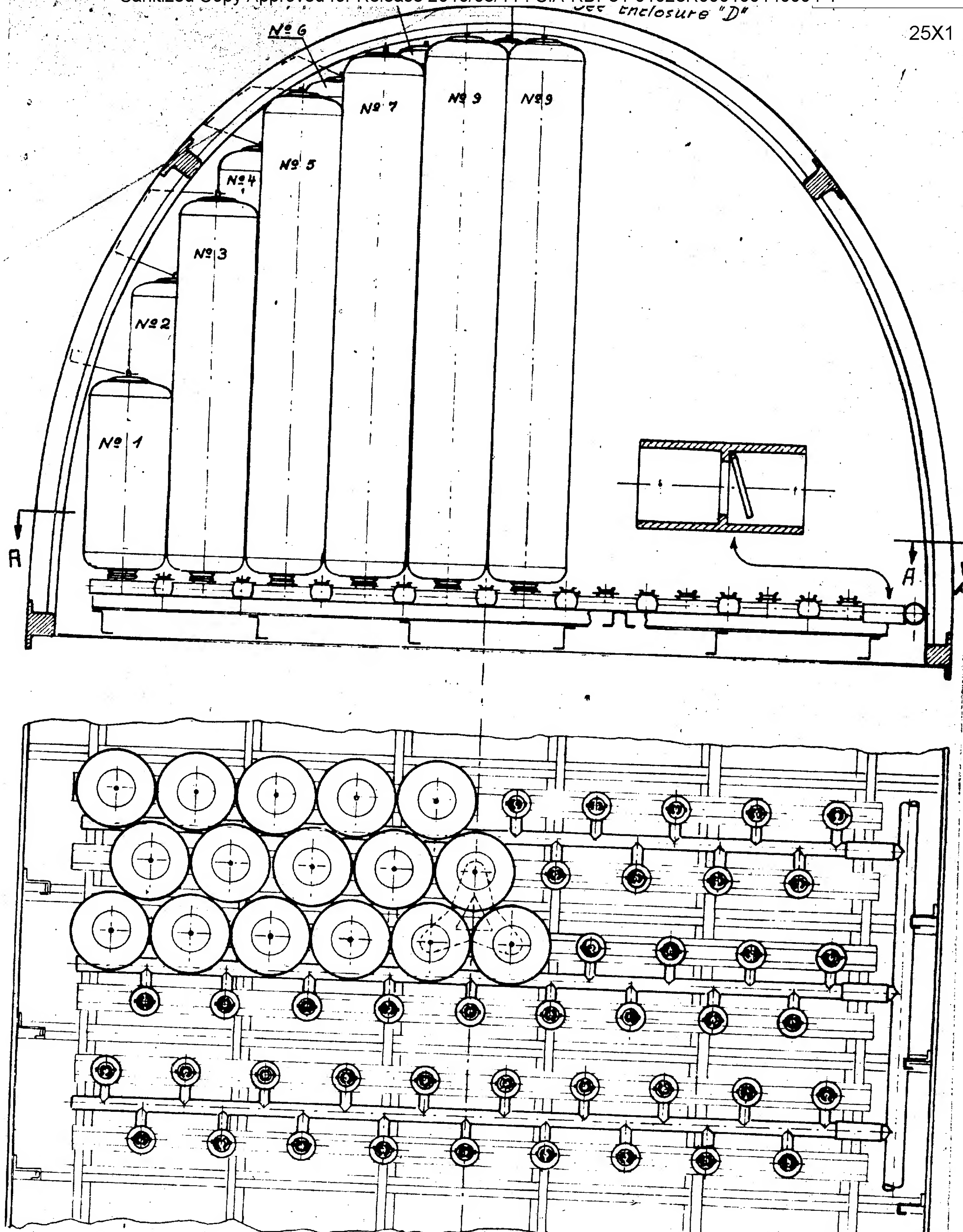
SECRET
SECURITY INFORMATION

25X1



ENCLOSURE (C) TOP VIEW OF THE EF150 AIRPLANE · SCALE - 1:100

SECRET

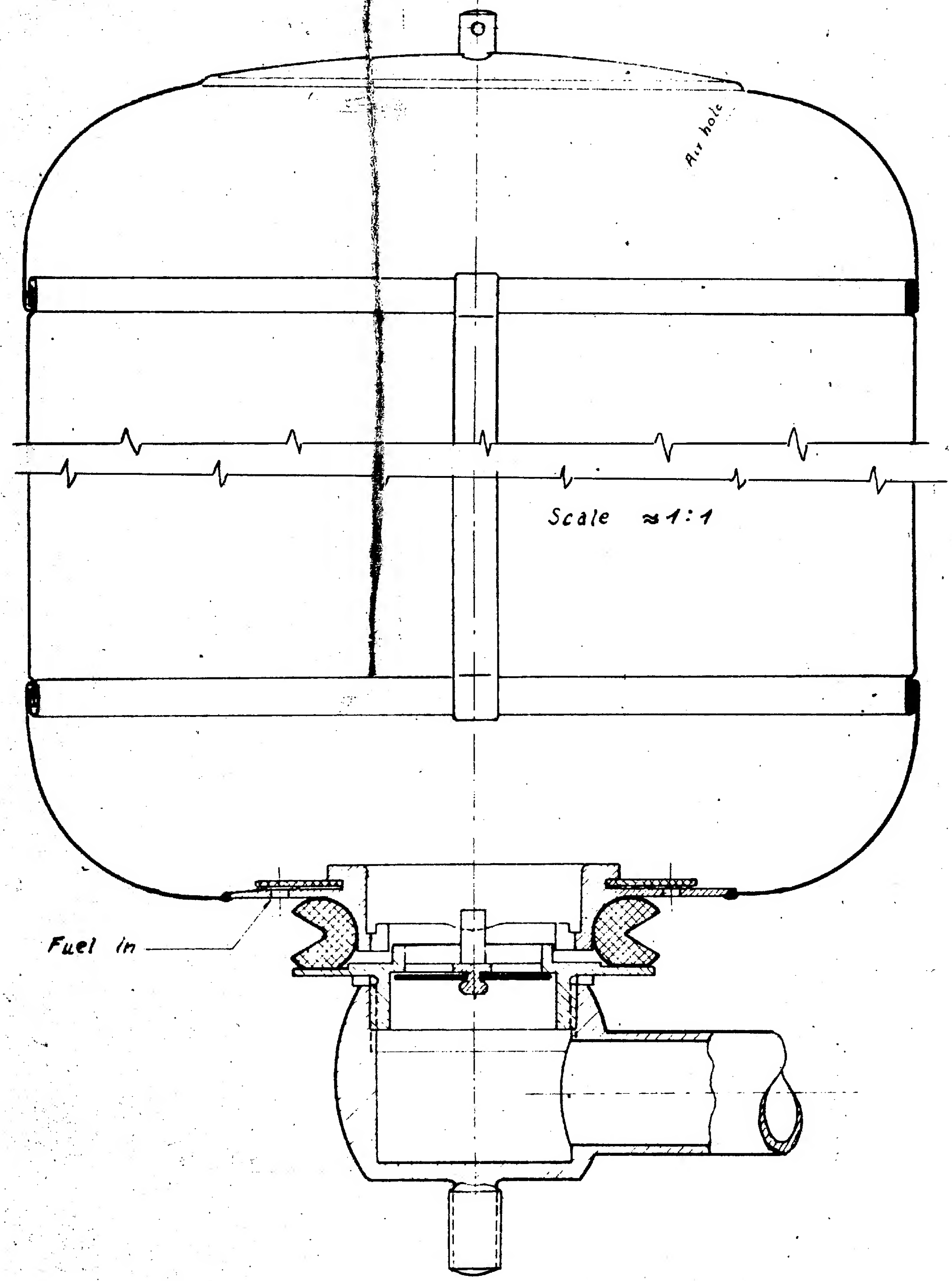


ENCLOSURE (E)

SECTION A-A

DETAILS OF FUSELAGE FUEL TANK

SECURITY INFORMATION



DETAIL OF TANK COMPARTMENT

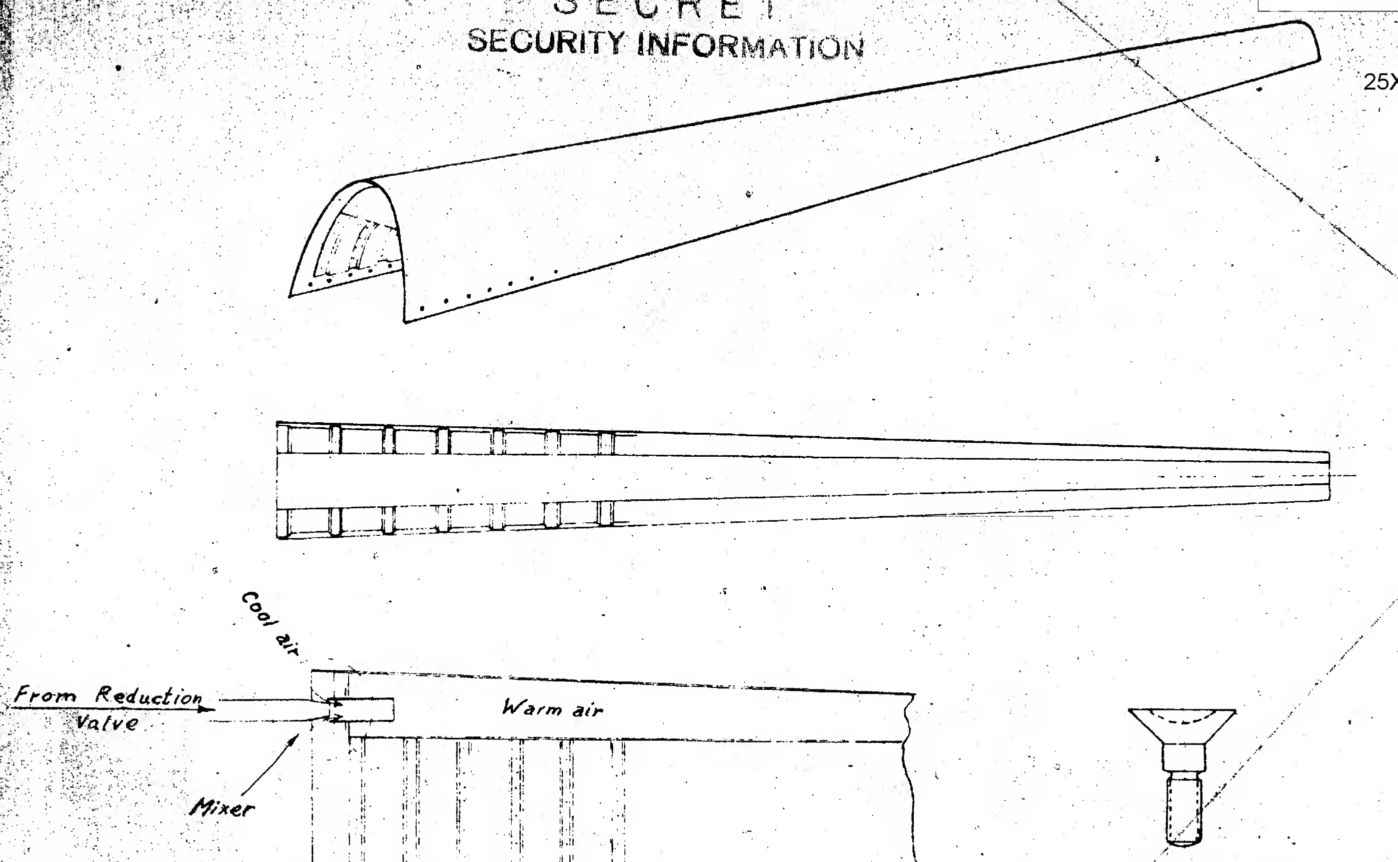
ENCLOSURE (F)

SCALE- 1:1

SECRET

SECRET
SECURITY INFORMATION

25X1



DETAILS OF DE-ICING SYSTEM

ENCLOSURE (H) -

SCALE - NONE

SECRET